IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Charles Steven KORMAN	)	Group Art Unit 1795
	)	Confirmation No. 5107
Serial No. 10/711,108	)	
	)	Examiner Thanh Truc TRINH
Filed: August 24, 2004	)	
	)	Attorney Docket 147903-1
	)	

For: PV LAMINATE BACKPLANE WITH OPTICAL CONCENTRATOR

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on October 22, 2009, and is in furtherance of said Notice of Appeal.

Table of Contents

This Appeal Brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.02:

I. REAL PARTY IN INTEREST

The real party in interest for this Appeal is:

General Electric Company by way of an Assignment recorded at Reel/Frame 015233/0722 on October 8, 2004.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 28 Claims pending in application.

B. Current Status of Claims

1. Claims canceled: None.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 1-28.
4. Claims allowed: None.
5. Claims rejected: 1-28.

C. Claims On Appeal

The Claims on Appeal are Claims 1-28.

IV. STATUS OF AMENDMENTS

In the Advisory Action dated October 14, 2009, the Examiner indicates that the Request for Reconsideration filed in response to the final Office action will be entered for purposes of Appeal. The status of the amendments to the Claims prior to filing the Notice of Appeal is as follows:

A. Responsive to a non-final Office action dated March 5, 2008, Appellant amended Claims 1, 4, 8, 10, 11, 15, 18, 22, 24 and 25 on June 3, 2008.

B. Responsive to a final Office action dated August 29, 2008, Appellant filed a Request for Continued Examination (RCE) and amended Claims 1 and 15 on November 24, 2008.

C. Responsive to a non-final Office action dated January 23, 2009, Appellant amended Claims 1 and 15 on April 17, 2009.

D. Responsive to a final Office action dated July 23, 2009, Appellant filed a Request for Reconsideration on September 21, 2009.

E. Responsive to an Advisory Action dated October 14, 2009, Appellant timely filed a Notice of Appeal on October 22, 2009.

V. SUMMARY OF CLAIMED SUBJECT MATTER

By way of background, providing electricity through photovoltaic (PV) cells is becoming more popular as this technology has decreased in cost and reliance on other sources of electric power is increasingly disfavored for environmental and strategic reasons. However, providing a cost effective PV module has been elusive since the cost of the PV module is dominated by the cost of the PV cells. See *Paragraph [0001].*

Increasing the efficiency of the PV cell also effectively reduces a cost/Watt, but not a 25% or greater cost reduction needed to make use of a PV cell economically viable. In laboratory tests under controlled conditions, the use of low-level light concentration (i.e., < 3X) has been shown to reduce a silicon footprint by as much as 40% while reducing efficiency by only about 20%. The idea of using concentrated sunlight within a module is not new and several companies have pursued this path. The downside of light concentration is the added cost of such implementation that has reduced the effective cost benefit of reducing a silicon footprint. In addition, the remaining solar cell footprint operates at higher temperatures further reducing the benefit because of efficiency losses. See *Paragraph [0005].*

Independent Claim 1 is directed to a photovoltaic (PV) laminate backplane assembly (16) comprising an insulative substrate (40) and a metal foil (42) having a first surface and a second surface opposite the first surface. See *Paragraph [0017] (Page 5, lines 3-7).* The first surface of the metal foil (42) is bonded to the insulative substrate (40) and the second surface includes an interconnect pattern (46) in electrical contact with pads (47) located on a same side of each solar cell (22) for electrically interconnecting a plurality of solar cells (22) in a series string (44). See *Paragraphs [0019] and [0020] (Page 5, lines 18-29).* The electrical current from each solar cell (22) in the series string (44) is transported from the pads (47) and combined at an edge connector (50) of the metal foil (42). See *Paragraph [0021] (Page 6, lines 1-6).* The series string (44) includes a bypass diode (48) for allowing the series string (44) to be bypassed in case of failure of the series string (44). See *Paragraph [0022] (Page 6, lines 7-15).* The second surface of the metal foil (42) also includes a light reflector disposed at exposed regions (54) on the second surface. See *Paragraph [0025] (Page 6, line26 - Page 7, line 7).* The light reflector is configured to reflect light incident thereon to increase a concentration of light on the solar cell. See *Paragraph [0025] (Page 6, line26 - Page 7, line 7).*

Independent Claim 15 is directed to a solar cell laminate assembly (16, 18) comprising a plurality of solar cells (22) each having a first side and a second side. See *Paragraph [0015] (Page 4, lines 18-27).* Each of the plurality of solar cells (22) is configured to produce an electrical current when receiving photons on at least said first side. An encapsulant (24) is operably coupled to the first side of each of said plurality of solar cells. See *Paragraph [0015] (Page 4, lines 18-27).* An insulative substrate (40) is operably coupled to the second side of each of the plurality of solar cells (22). A metal foil (42) has a first surface and a second surface opposite the first surface. See *Paragraph [0017] (Page 5, lines 3-7).* The first surface of the metal foil (42) is bonded to the insulative substrate (40) and the second surface includes an interconnect pattern (46) in electrical contact with pads (47) located on a same side of each solar cell (22) for electrically interconnecting a plurality of solar cells (22) in a series string (44). See *Paragraphs [0019] and [0020] (Page 5, lines 18-29).* The electrical current from each solar cell (22) in the series string (44) is transported from the pads (47) and combined at an edge connector (50) of the metal foil (42). See *Paragraph [0021] (Page 6, lines 1-6).* The series string (44) includes a bypass diode (48) for allowing the series string (44) to be bypassed in case of failure of the series string (44). See *Paragraph [0022] (Page 6, lines 7-15).* The second surface of the metal foil (42) also includes a light reflector disposed at exposed regions (54) on the second surface. See *Paragraph [0025] (Page 6, line26 - Page 7, line 7).* The light reflector is configured to reflect light incident thereon to increase a concentration of light on the solar cell. See *Paragraph [0025] (Page 6, line26 - Page 7, line 7).*

FIG. 2

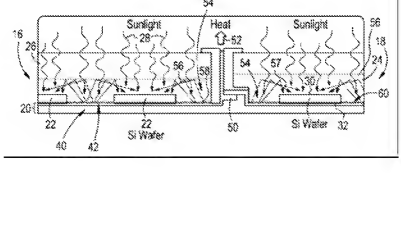


FIG. 3

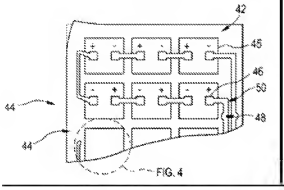
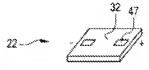


FIG. 4



VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether Claims 1-3, 7-12, 15-17 and 21-26 are unpatentable under 35 U.S.C. 103(a) over Cole (U.S. Patent No. 6,008,449, hereinafter "Cole") in view of Stein et al. (U.S. Patent No. 5,071,491, hereinafter "Stein") or Hollaus et al. (U.S. Patent No. 4,567,316, hereinafter "Hollaus").

2. Whether Claims 4-6, 13, 18-20 and 27 are unpatentable under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus, and further in view of Epstein (U.S. Patent Application Publication No. 2003/0058553, hereinafter "Epstein"), and Claims 14 and 28 under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus, and further in view of Glenn (U.S. Patent No. 6,313,396, hereinafter "Glenn").

3. Whether Claims 14 and 28 are unpatentable under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus, and further in view of Glenn (U.S. Patent No. 6,313,396, hereinafter "Glenn").

VII. ARGUMENT

1. Rejection of Claims 1-3, 7-12, 15-17 and 21-26 under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus

Independent Claims 1 and 15 specify, *inter alia*, the feature of a metal foil having a first surface and a second surface opposite the first surface, wherein the first surface of the metal foil is bonded to an insulative substrate and the second surface of the metal foil includes an interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrical interconnecting a plurality of solar cells in a series string. Electrical current from each solar cell in the series string is transported from the pads and combined at an edge connector of said metal foil. The series string includes a bypass diode for allowing the series string to be bypassed in case of failure of the series string. Support for this feature can be found, for example, in *Paragraphs [0020] and [0021]* and shown in *Figures 3 and 4 below.*

FIG. 3

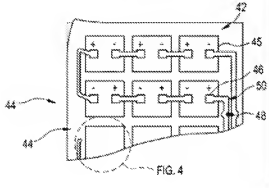
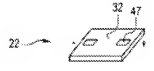


FIG. 4



Cole discloses electrically connecting opposite sides of each solar cell 22 to the reflective layer 48 in series. Specifically, adjacent solar cells 22 are electrically coupled by connecting a thin film portion 66 and a substrate 68 of each solar cell to the reflective layer 48 with conductive contacts 72. The reflective layer 48 has gaps at the transparent regions 42 so that current is directed in series through each solar cell 22. See *Figs. 1 and 5* below; *col. 7, lines 55-61*. The conductive contact 72 may comprise continuous beads or intermittent bead portions that are formed from solder or other conductive materials to electrically couple solar cells 22 by way of the reflective layer 48 positioned between each pair of solar cells. Thus, the reflective layer 48 in Cole serves a dual purpose of electrically coupling adjacent solar cells 22 and reflecting incident radiation. See *col. 7, line 63-col. 8, line 7*.

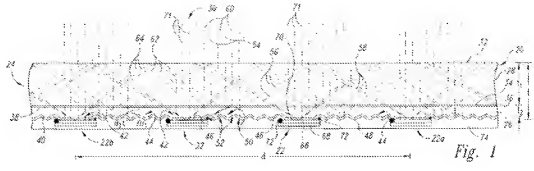


Fig. 1

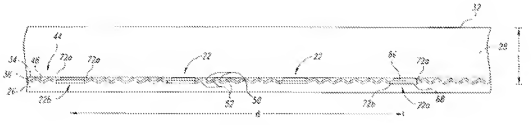


Fig. 5

Appellant agrees with the Examiner that Cole does not teach "an edge connector and a bypass diode so that the electrical current from each solar cell in the series string is transported from the pads and combined at an edge connector, and series string is bypassed in case of failure of the series string." See *Page 3* of the final Office action.

However, Appellant respectfully disagrees with the Examiner that Cole teaches a metal foil having a first surface and a second surface opposite the first surface, wherein the first surface of the metal foil is bonded to an insulative substrate and the second surface of the metal foil includes an interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrical interconnecting a plurality of solar cells in a series string, as recited in Claims 1 and 15.

In the Advisory Action, the Examiner states "[t]he pads are the locations of attaching/bonding the metal foil to the solar cells for connecting a plurality solar cells in a series string…The metal foil (e.g. 48) is attached to solar cell by conductive contact 72 which is formed solder or other conductive material (see col. 7 line 66 through col. 8 line 7)."

Appellant respectfully disagrees with this assertion by the Examiner for several reasons. First, the second surface of the reflective layer 48 in Cole does not have an interconnect pattern. Second, the same side of the solar cell 22 in Cole does not include pads, which is a term well-known in the solar cell art. Rather, the reflective layer 48 interconnects adjacent solar cells by the conductive contacts 72 (i.e., by solder joints). Therefore, the reflective layer 48 cannot interconnect adjacent solar cells by contacting the pads of the solar cell, as recited in the claimed invention.

Stein and Hollaus add nothing to overcome this shortcoming in Cole. Thus, the combination of Cole, Stein and Hollaus fails to teach or suggest all the claim limitations, and the Office action fails to establish a *prima facie* case of obviousness.

For at least this reason, Claims 1-3, 7-12, 15-17 and 21-26 are allowable over the applied art, taken singly or in combination, so the rejection of Claims 20 and 22-24 is unsupported by the art and should be reversed.

In addition, dependent Claims 8 and 22 specify, *inter alia*, that the metal foil is patterned to match an interconnection configuration of a PV laminate module. In the final Office action, the Examiner states: "Cole teaches the metal foil (or metallic reflective layer 48) is electrically conductive and bonded directly to the substrate of the solar cells at a bond site 72b. (See Figure 5 and col. 9 lines 22-46). Therefore it is the Examiner's position that the metal foil (or metallic reflective layer 48) is patterned to match at least an interconnection configuration of the solar cell and a PV laminate module." Appellant respectfully disagrees with this assertion.

According to *MPEP §2111*:

"During patent examination, the pending claims must be 'given their broadest reasonable interpretation consistent with the specification.' The Federal Circuit's en banc decision in *Phillips v. AWH Corp.*, 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005) expressly recognized that the USPTO employs the 'broadest reasonable interpretation' standard:

> The Patent and Trademark Office ('PTO') determines the scope of claims in patent applications not solely on the basis of claim language, but upon giving claims their broadest reasonable construction 'in light of the specification as it would be interpreted by one of ordinary skill in the art.' *In re Am. Acad. Of Sci.*

> *Tech. Ctr.*, 367 F.3d 1359, 1364 [70 USPQ2d 1827] (Fed. Cir. 2004). Indeed, the rules of the PTO require that application claims must 'conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.' 37 CFR 1.75(d)(1)" (Emphasis added).

The interconnection pattern 46 of the metal foil 42 as recited in the claimed invention is shown in Figures 3 and 4 below. As shown, the interconnection pattern 46 interconnects a plurality of solar cells 22 by connecting the positive pad from one solar cell to the negative pad on the same side of an adjacent solar cell. The current from the segments is transported from corresponding pads 47 on the second side 32 of each solar cell 22 in a series string 44 and combined at an edge connector 50 of the metal foil 42.

FIG. 3

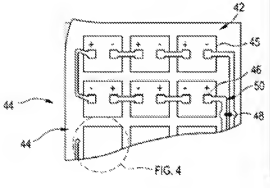
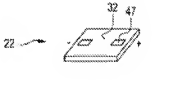


FIG. 4



Although the reflective layer 48 in Cole has gaps at the transparent regions 42 so that current is directed in series through each solar cell 22, in no way whatsoever can the conductive contacts 72 in the form of continuous beads be considered to contact pads on the same side of each solar cell, as recited in the claimed invention. Therefore, the Examiner's position that the metal foil is patterned to match at least an interconnection configuration of the solar cell and a PV laminate module is misplaced.

For at least this additional reason, Claims 8 and 22 are allowable over the applied art, taken singly or in combination, so the rejection of Claims 8 and 22 is unsupported by the art and should be reversed.

2. Rejection of Claims 4-6, 13, 18-20 and 27 under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus, and further in view of Epstein

Claims 4-6 and 13 depend from Claim 1, and Claims 18-20 and 27 depend from Claim 15.

Epstein discloses a metal coating layer 130, 230 on a structured surface 114, 214 including a plurality of triangular prisms 140, 240. A diffuser layer 135, 235, such as a polymethyl-methacryalate polymer loaded with polymeric or glass beads overlays the metal coating layer 130, 230. See *Figs. 3 and 4; Paragraphs [0101]-[0108] and [0112]-[0118].*

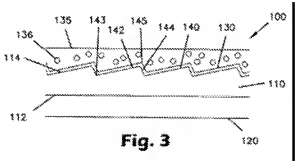


Fig. 3

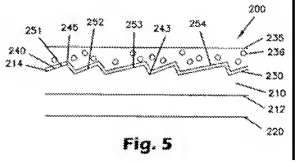


Fig. 5

There is no mention in Epstein of the feature of a metal foil having a first surface and a second surface opposite the first surface, wherein the first surface of the metal foil is bonded to an insulative substrate and the second surface of the metal foil includes an interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrical interconnecting a plurality of solar cells in a series string, as recited in Claims 1 and 15.

For the same reason as given above in Section VII.1, Claims 4-6, 13, 18-20 and 27 are also allowable over the applied art, taken singly or in combination, so the rejection of Claims 4-6, 13, 18-20 and 27 is unsupported by the art and should be reversed.

In addition, there is no mention in Epstein of the feature a coating including reflective ink, wherein the ink includes a colloidal suspension of glass spheres in an optically transparent binder, as recited in dependent Claims 5 and 6.

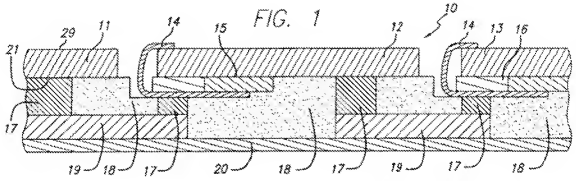
For at least this additional reason, Claims 5, 6, 19 and 20 are allowable over the applied art, taken singly or in combination, so the rejection of Claims 5, 6, 19 and 20 is unsupported by the art and should be reversed.

3. Rejection of Claims 14 and 28 under 35 U.S.C. 103(a) over Cole in view of Stein or Hollaus, and further in view of Glenn

Claim 14 depend from Claim 1, and Claim 28 depends from Claim 15, and further specify, *inter alia*, that the substrate includes a plurality of metalized vias to allow dissipation of heat therethrough.

Glenn discloses a solar cell module 10 with a first solar cell 11, a second solar cell 12 and a third solar cell 13, each solar cell having a rear side 21 and a top side 29. A bypass diode 15 is attached to the rear side 21. A bonding element 18 is disposed underneath and adhered to portions of the rear side 21 and portion of a tab 14. The bonding element 18 is also adhered to a flexible substrate 20. The bonding element 18 includes a plurality of openings 22 that are in a pattern. A plurality of conductive elements 17 is immediately underneath and in contact with each tab 14 and each rear side 21 of the cells 11-13, each conductive element 17 correlating to an opening 22 in the bonding element 18. Metal traces 19 are provided on the substrate 20 such that the distal ends of the traces 19 match the opening pattern of opening 22 on the bonding element 18 and the conducting pattern of conducting elements 17. As a result, one distal end of a metal trace 19 matches a conducting element 17 affixed to the rear side 21 of a cell 11-13. The other distal of the metal trace 19 matches a conducting element 17 affixed to the tab. In this manner, the metal traces 19 electrically connect one cell to an adjacent cell 11-13. See Figs. 1, 3B and 4

FIG. 1



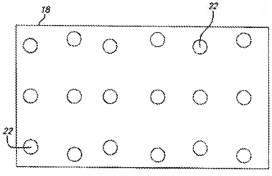


FIG. 3B

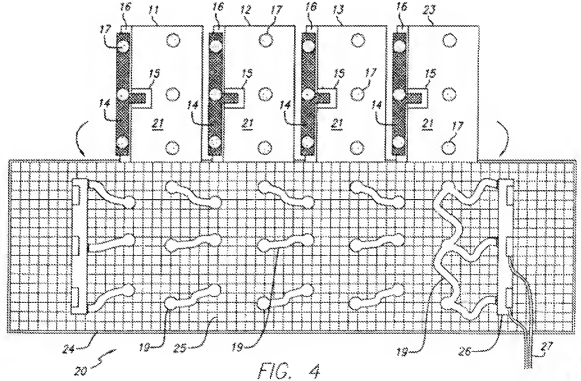


FIG. 4

There is no mention in Glenn of the feature of a metal foil having a first surface and a second surface opposite the first surface, wherein the first surface of the metal foil is bonded to an insulative substrate and the second surface of the metal foil includes an interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrical interconnecting a plurality of solar cells in a series string, as recited in Claims 1 and 15.

For the same reason as given above in Section VII.1, Claims 14 and 28 are allowable over the applied art, taken singly or in combination, so the rejection of Claims 14 and 28 is unsupported by the art and should be reversed.

On Page 7 of the final Office action, the Examiner states: "it is the position of the Examiner that Glenn teaches a substrate includes a plurality of metalized vias to allow dissipation of heat therethrough." Appellant respectfully disagrees with this assertion.

There is no mention in Glenn of the feature a coating including reflective ink, wherein the ink includes a colloidal suspension of glass spheres in an optically transparent binder, as recited in dependent Claims 14 and 28.

In Glenn, the substrate 20 does not include vias. Rather, the bonding element 18 includes the openings 22. Further, the openings 22 in Glenn allow for the conducting elements 17 to pass therethrough to interconnect adjacent solar cells, not for the dissipation of heat, as asserted by the Examiner.

For at least this additional reason, Claims 14 and 28 are also allowable over the applied art, taken singly or in combination, so the rejection of Claims 14 and 28 is unsupported by the art and should be reversed.

In view of the foregoing, Appellant respectfully submits that the application is in condition for allowance. Favorable consideration and prompt allowance of the application is earnestly solicited.

Dated: December 15, 2009

Respectfully submitted,

By /Peter J. Rashid/

Peter J. Rashid, Reg. No. 39464

VIII. CLAIMS APPENDIX

1. A photovoltaic (PV) laminate backplane assembly comprising:

an insulative substrate; and

a metal foil having a first surface and a second surface opposite the first surface, the first surface of the metal foil bonded to said insulative substrate and the second surface including an interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrically interconnecting a plurality of solar cells in a series string such that electrical current from each solar cell in the series string is transported from the pads and combined at an edge connector of said metal foil, the series string including a bypass diode for allowing the series string to be bypassed in case of failure of the series string, the second surface of said metal foil also including a light reflector disposed at exposed regions on the second surface, said light reflector configured to reflect light incident thereon to increase a concentration of light on the solar cell.

2. The assembly of claim 1, wherein said substrate comprises a polymeric substrate.

3. The assembly of claim 2, wherein said polymeric substrate comprises one of a flexible and a rigid polymer.

4. The assembly of claim 1, wherein said exposed regions on said second surface of said metal foil are disposed proximate peripheral edges of said solar cell and are augmented by a coating.

5. The assembly of claim 4, wherein said coating includes a reflective ink.

6. The assembly of claim 5, wherein said ink includes a colloidal suspension of glass spheres in an optically transparent binder.

7. The assembly of claim 1, wherein said metal foil is at least one of copper, aluminum and a conductive metal foil selected on a basis of cost, electrical, and thermal performance.

8. The assembly of claim 7, wherein said metal foil is further patterned to match an interconnection configuration of a PV laminate module.

9. The assembly of claim 8, wherein said metal foil is configured to provide a low resistance interconnection of a plurality of solar cells while providing a thermal sink for heat generated by each cell.

10. The assembly of claim 9, wherein said metal foil is configured for channeling heat generated by at least one of said solar cells to an edge of said module.

11. The assembly of claim 10, wherein said edge of said module is configured to dissipate said generated heat by one of radiation and convection.

12. The assembly of claim 1, wherein said metal foil functions as an electrical conductor, thermal conductor, and an optical reflector.

13. The assembly of claim 1, wherein said substrate includes a flexible polymer and said metal foil includes a reflective coating disposed proximate at least one edge of said solar cell.

14. The assembly of claim 1, wherein said substrate includes a plurality of metallized vias to allow dissipation of heat therethrough.

15. A solar cell laminate assembly comprising:

a plurality of solar cells each having a first side and a second side, each of said plurality of solar cells configured to produce an electrical current when receiving photons on at least said first side;

an encapsulant operably coupled to the first side of each of said plurality of solar cells;

an insulative substrate operably coupled to the second side of each of said plurality of solar cells; and

a metal foil having a first surface and a second surface opposite the first surface, the first surface bonded to said insulative substrate and the second surface including an

interconnect pattern in electrical contact with pads located on a same side of each solar cell for electrical interconnecting a plurality of solar cells in a series string such that electrical current from each solar cell in the series string is transported from the pads and combined at an edge connector of said metal foil, the series string including a bypass diode for allowing the series string to be bypassed in case of failure of the series string, the second surface of said metal foil also including a light reflector disposed at exposed regions on the second surface, said light reflector configured to reflect light incident thereon to increase a concentration of light on the solar cell.

16. The assembly of claim 15, wherein said substrate comprises a polymeric substrate.

17. The assembly of claim 16, wherein said polymeric substrate comprises one of a flexible and a rigid polymer.

18. The assembly of claim 15, wherein said exposed regions on said second surface of said metal foil are disposed proximate peripheral edges of said each solar cell and are augmented by a coating.

19. The assembly of claim 18, wherein said coating includes a reflective ink.

20. The assembly of claim 19, wherein said ink includes a colloidal suspension of glass spheres in an optically transparent binder.

21. The assembly of claim 15, wherein said metal foil is at least one of copper, aluminum and a conductive metal foil selected on a basis of cost, electrical, and thermal performance.

22. The assembly of claim 21, wherein said metal foil is further patterned to match an interconnection configuration of a PV laminate module.

23. The assembly of claim 22, wherein said metal foil is configured to provide a low resistance interconnection of said plurality of solar cells while providing a thermal sink for heat generated by said each solar cell.

24. The assembly of claim 23, wherein said metal foil is configured for channeling heat generated by at least one of said solar cells to an edge of said module.

25. The assembly of claim 24, wherein said edge of said module is configured to dissipate said generated heat by one of radiation and convection.

26. The assembly of claim 15, wherein said metal foil functions as an electrical conductor, thermal conductor, and an optical reflector.

27. The assembly of claim 15, wherein said substrate includes a flexible polymer and said light concentrator includes a reflective coating disposed proximate said edges of said each solar cell.

28. The assembly of claim 15, wherein said substrate includes a plurality of metallized vias to allow dissipation of heat therethrough.

IX. EVIDENCE APPENDIX

No evidence pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 is/are entered by the Examiner. Accordingly, no evidence is/are relied upon by the Appellant in this paper.

X. RELATED PROCEEDINGS APPENDIX

No related proceedings pursuant to 37 C.F.R. § 41.37(c)(1)(ii) is/are entered by, relied upon, or submitted by the Appellant with this paper.